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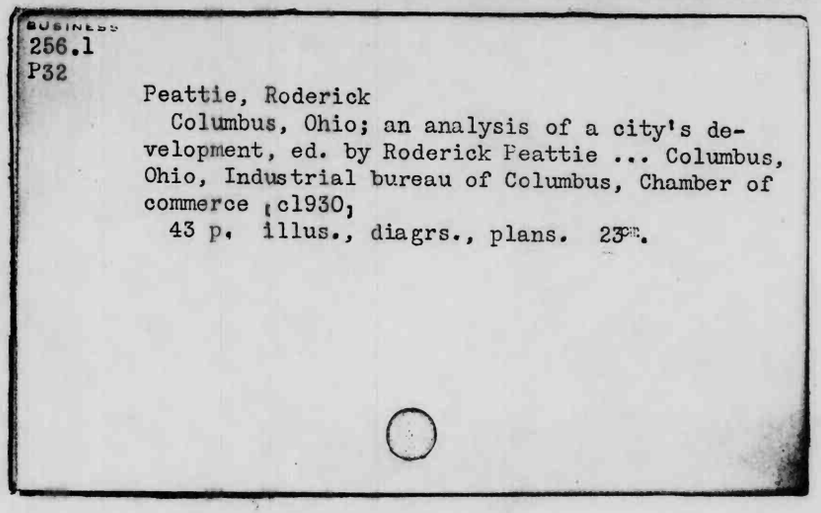

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Foreword

A prime function of the Industrial Bureau of Columbus is to collect, collate, and interpret facts relative to Columbus and Central Ohio. So many inquiries come daily to this Bureau, requesting accurate information on some phase of the City's development, that it is our pleasure to present herewith an analysis of the Columbus region written and edited by representatives from the Ohio State University, the United States Weather Bureau, and the Industrial Bureau of Columbus. Where more definite information with respect to some specific industry is concerned, our staff is prepared to undertake a careful study of the situation, entirely without obligation.

FRED D. CONNOLLEY,
Director.

Columbus, Ohio

An Analysis
of a
City's Development

EDITED BY
RODERICK PEATTIE
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CHAPTER I.

BEGINNINGS OF COLUMBUS

OSMAN C. HOOPER
Department of Journalism, Ohio State University

COLUMBUS emerged from the wilderness as the capital of Ohio, February 14, 1812 (St. Valentine's day). It was then that the General Assembly, sitting at Zanesville, to which place it had removed in 1810 from Chillicothe, accepted the proposition of Lyne Starling, Alexander McLaughlin, John Kerr, and James Johnston to locate the capital on the "high banks of the Scioto", opposite Franklinton. A week later, the General Assembly adopted the proposition of Jacob Foos to call the site Columbus.

The men named, who were the owners of the land, had provisionally platted the tract and offered to deed to the State a square of ten acres for the capitol and other necessary buildings, and another lot of similar size for the Penitentiary, and to erect thereon at their own expense up to $50,000 such structure as the General Assembly might direct. If the buildings on a fair appraisal were found to be worth less than the sum named, the difference was to be paid by the proprietors of the tract to the State; if the appraisal amounted to more than that sum, the difference was to be paid by the State to the proprietors.

It was not an easy victory. Franklinton, which had been laid out and settled in 1797, was a competitor. Franklinton was the village which preceeded Columbus and was later absorbed by it. Worthington, nine miles north of Columbus and settled in 1803, also made a bid for the state government. Other competitors were Dublin, Delaware, Lancaster, Newark, Chillicothe, Pickaway Plains and a site near the later established Camp Chase. This last was the great Civil War camp and near it today is a huge Confederate cemetery of those who died prisoners of war. This cemetery is one of the impressive sights of Columbus. The committee, appointed to consider the various offers, reported in favor of Dublin, but the superior generalship of Starling and his associates won for them the prize. The permanence of the location was the only serious question, and that was met by an agreement that the capital should remain at Columbus till May 1, 1840, "and from thence until otherwise provided by law."

The four proprietors associated themselves as partners, each agreeing to put into a joint ownership of land the portion that he owned and to contribute annually to the common fund the amount of money necessary to erect the buildings. An agent was appointed for these partners, and the General Assembly appointed Joel Wright of Warren County as State Director, charged with superintending the survey and platting the town, determining the width of streets and alleys, selecting the Capitol Square and the lot for the Penitentiary, supervising the erection of the necessary buildings, and levying and disbursing taxes on the town property. When Wright had completed the task of planning the town, he felt that his mission had been accomplished; accordingly he resigned his commission as State Director. Wm. Ludlow was appointed "Director of the Town of Columbus" and represented the state in most of the building operations.

The tract that was thus to be transformed into a town site bore few marks of civilization. Robert Ballantine's water-power mill and White's distillery stood on the river bank north of the present Broad Street; John Brickell lived in a log cabin and cultivated a garden on an old Indian encampment in front of the present Penitentiary. There was a cabin in a small clearing near the foot of Rich Street, and south of the Indian mound, from which Mound Street got its name, was the Hamlin home. High Street, thickly wooded, was known as Wolf Ridge because wolves were so frequently seen there. To the east, along what is now Spring Street were numerous springs which fed Doe Run and Lizard Creek which, uniting poured their waters through a gulley across High Street into the Scioto. At Broad and Twentieth Streets was Crookedwood Pond; at Fourth and State Streets, another pond called Haskins', from which sprang a brook. This brook united at Fourth and Main Streets with another which had its origin near Washington Avenue and Rich Street, and the combined waters passed through what was known as Peters' Run into the Scioto. With the woods, the morasses, the ponds and runs, Columbus battled for years.

The first public buildings on Capitol Square numbered three—a square, two-story building, with a spire in the center of the roof, for the General Assembly, at the corner of State and High Streets. North of it on High Street was a building for the state offices, and beyond that a structure for the United States Court. The site originally chosen for the Penitentiary was at Scioto and Mound Streets. A brick building was there erected and served indifferently until 1833 when the present site was chosen and the first building thereon occupied.

The General Assembly first met in the structure provided for it December 2, 1816, the members riding in on horses which were returned to the country for wintering, or coming in skiffs on the river. In the following month, January, 1817, there was a settlement with the four proprietors, the State paying to them $35,000, the excess of appraisal value over the amount they agreed to contribute.

With the location of the State capital at Columbus, both business and population began to be transferred to it from Franklinton and from Worthington. When the site of Columbus was fixed, Franklinton across the river was a village of several hundred people, and in the War of 1812 became important as a military rendezvous, the headquarters of General William Henry Harrison, and the place of conference with the Indians who, it was feared, would attack the town, if the men went to war. A newspaper, the Freeman's Chronicle, was published there by James B. Gardiner for three years. The site of the Indian conference is now marked by a boulder, placed in one of the street parks by the Daughters of the Revolution in 1904. The first Franklin County courts were held in Franklinton until 1824, when Columbus became the county-seat as well as the State capital.

From Worthington came the Worthington Manufacturing Company, which carried on in Columbus as the Kilbourne and Kilbourne-Jacobs Manufacturing Company for a century. Also the Western Intelligencer, a weekly newspaper, now the daily and Sunday Ohio State Journal. Its first rival Democratic paper, the Ohio Monitor, was begun in 1816 by David Smith, its last successor, the News, expiring in 1907.

When Columbus was incorporated as a city in 1834, it had a population of about 3,500; in 1860, the population was 18,629; in 1870, 31,274; in 1880, 51,674; in 1890, 88,150; in 1900, 125,560; in 1910, 181,511, and in 1920, 237,031.

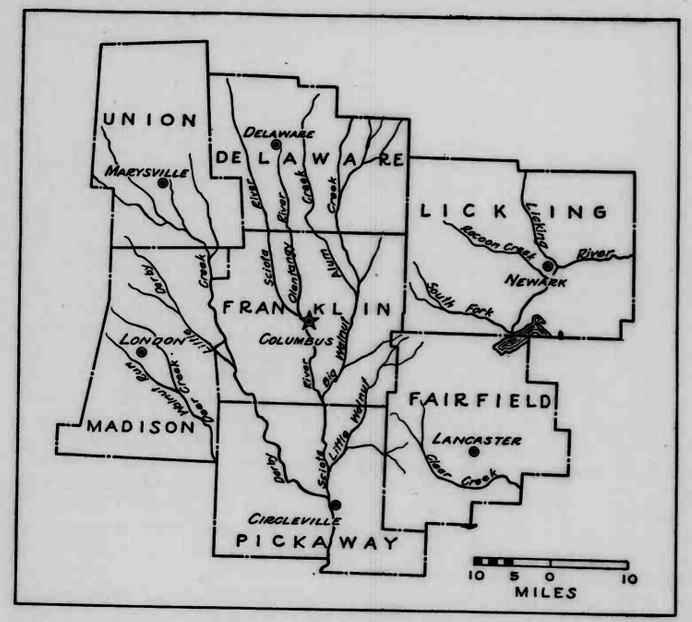

FIG. 1. A Map of Central Ohio

Through Franklinton, then its neighbor, now a part of the city, Columbus was a military rendezvous in the War of 1812; it sent several companies for the war with Mexico in 1846. In the Civil War period, troops were recruited and organized, first at Camp Jackson (now Goodale Park) and later at Camp Chase on West Broad Street. For the War with Spain in 1898, there was Camp Bushnell, beyond Bexley, East Broad; and for the World War, the State Fair Grounds were used for a similar purpose.

Some First Things

The first sale of lots began June 18, 1812.

The first market house was erected in the middle of High Street, south of Rich Street, in 1814.

The first President of the United States to visit Columbus was James Monroe in 1817.

The first brick residence was built by Wm. Merion, west of High and south of Moler Street.

The first Mayor was Jarvis Pike, elected in 1816 by the Councilmen.

The first paved street was High Street, the material being Nicholson block, in 1867.

The first municipal waterworks began operation March 6, 1871.

The first fire of magnitude occurred in the spring of 1822. That year the first fire department was organized.

The first sewer was constructed in Broad Street in 1849.

The first street-lighting was by gas in 1850.

The first use of electricity for lighting the street was in 1884.

The first use of natural gas for lighting and heating was 1889.

The first park created was Goodale Park, given to the city by Dr. Lincoln Goodale in 1851.

The first telephone was installed in 1879.

The first cemetery was in Franklinton near the river bank. The next, planned at the founding of Columbus, was on a tract now occupied by the North Market.

The first roads were four, opened by the county before the laying out of Columbus—from Franklinton to Lancaster, to Springfield, to Worthington, and to Newark. The first improved road out of Columbus was built by the State Director to Granville in 1814. The following year by the same authority, roads to Newark, to Springfield, and to London, were improved. In 1816 began the period of road-building by private enterprise.

The first postal service began in Franklinton in 1805. The first wheeled mail and passenger service for Columbus was 1816.

Work on the Columbus branch of the Ohio canals was begun April 30, 1827.

The first tavern was opened in 1813 in a two-story building on the west side of High Street just south of State Street. The first hotel on the Neil House site was opened in 1832.

The first Hospital for the Insane was located on Broad Street between Eleventh Street and Garfield Avenue. Erected in 1838, it was burned in 1868.

The State Arsenal, erected in 1860, stands on the site originally chosen for the Penitentiary.

The first church building in Columbus was the Presbyterian, a log structure, built near Spring and Third Streets in 1814. There the first school east of the Scioto was conducted in the same year.

The first Catholic church was Holy Cross, built at Rich and Fifth Streets in 1832.

The first Jewish congregation was organized in 1849 by Simon Lazarus and others.

The first railroad out of the city was the Columbus & Xenia, built in 1850.

The first street car, horse-drawn, appeared on High Street in 1863. Electricity as a motive power was first used in 1891.

The first bank was the Franklin Bank of Columbus in 1816.

The first Building and Loan Association was the Franklin, in 1868.

The first Board of Trade was organized in 1858.

CHAPTER II.

THE GEOLOGY OF THE COLUMBUS REGION

J. Ernest Carman
Department of Geology, Ohio State University

Physiography and Glacial Deposits

THE Columbus region is located near the eastern edge of the Central Low Plains only a few miles east of the edge of the Appalachian plateau. The region is, in general, an even glacial plain broken only by a few relatively narrow valleys cut 50 to 100 feet below the level of the plain. At places, as between Alum and Big Walnut creeks east of the city, the inter-valley upland areas are notably flat.

The region is drained by parallel, southward-flowing streams all of which belong to the Scioto drainage system. Two of these streams, the Scioto and Olentangy, unite at Columbus, and a third, Alum creek, flows thru the east part of the city (Fig. 1).

Central Ohio was covered by at least two ice sheets, the Illinoian and the Wisconsin, and probably by another earlier ice sheet. Columbus was near the axial line of the Scioto lobe of the Wisconsin ice sheet, the outlines of which at various stages are marked by the concentric moraines to the north and south. The largest of these moraines near Columbus is the Powell moraine extending east-west thru New California, Powell and Sunbury about 15 miles north of Columbus.

The Wisconsin till of the region comes to the surface, being, in general, leached to a depth of 2 to 3 feet and oxidized to a depth of 8 to 10 feet. It is a sandy, pebbly clay, becoming more compact with depth. The deeper exposures of drift may show a still more compact, bluish till which is commonly interpreted as Illinoian. This, in places, is rather definitely separated from the Wisconsin till above by sands or old soils which may be interglacial, but more commonly this denser blue till passes without sharp contact to the Wisconsin till above.

The thickness of the drift varies greatly and abruptly from place to place showing an uneven bed rock surface upon which the drift was deposited. The details concerning this bed rock surface are not known, but sufficient data are available to show that very considerable valleys existed which are now buried.

Such an area exists under the down-town portion of Columbus. It is 110 feet to bed rock at the American Insurance Union building at Front and Broad Streets, or over 50 feet below the Scioto river. It is 125 feet to bed rock in the northeast part of the State House grounds, and depths of 100 to 200 to rock are general in down-town Columbus. This area of deep drift, one to two miles across, continues south through South Columbus and northeast thru Shepard. A considerable part of the filling of this old valley is gravel which affords a great reservoir for ground water, and this source is being extensively drawn upon for water for industrial uses in the South Columbus district.

The Bed Rock

A sufficient number of bed rock exposures exists in the valleys and in quarries around Columbus to show the dominant features of the bed rock geology. The rocks of the region have a slight dip to the east of about 60 feet to the mile and a result of this, successively younger formations outcrop from west to east across the region and the bands of outcrop have a general north-south direction. This is in conformity with all central and eastern Ohio. A geologic map of the Columbus region adapted from the Columbus folio, No. 197, Geological Atlas of the United States, is shown as figure 2.

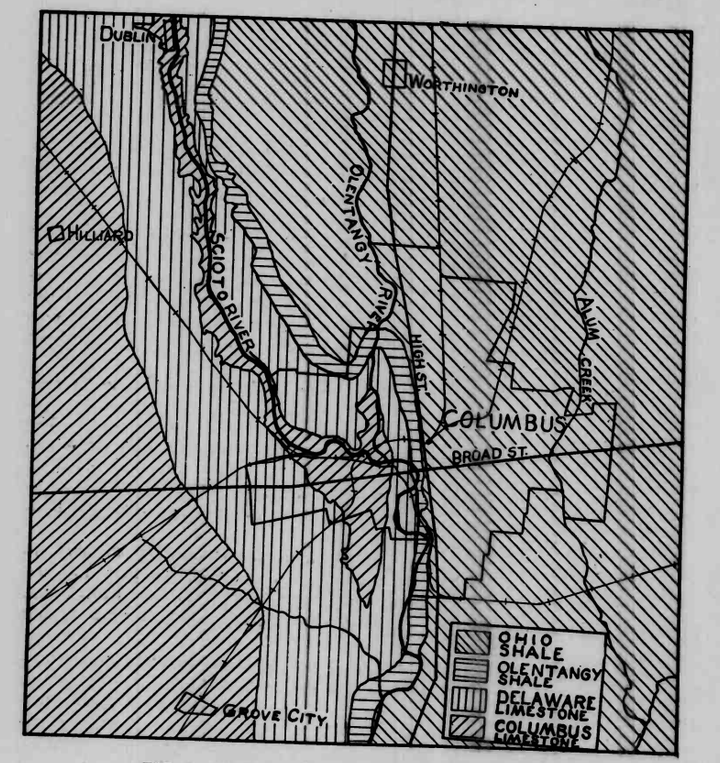

FIG. 2. Geological Map of the Vicinity of Columbus

The rocks of the Columbus region belong to the Devonian system. The formations and their approximate thicknesses are as follows:

Ohio shale	700 feet
Olentangy shale	35 "
Delaware limestone	35 "
Columbus llimestone	100 "

The belt underlain by the Columbus limestone is west of the city, west of the Scioto River valley (Fig. 2). Outcrops are common within the Scioto valley from the O'Shaughnessy dam in Delaware County southward past the Griggs dam and Marble Cliff to a point where the river turns eastward, west of the city. Excellent exposures of the upper half of the formation exist in the quarries of the Marble Cliff Stone Company along the west side of the Scioto valley 4 to 6 miles northwest of the city. Because of a slight dip southward successively lower zones are exposed northward along the Scioto valley until the base of the formation is reached in western Delaware County.

The Columbus limestone is gray to brown, crystalline, fossiliferous, and exists in relatively even beds which vary in thickness at different horizons from 4 to 6 inches to 4 to 6 feet. The formation has a thickness of about 100 feet. A section of zones proposed by Stauffer can be used generally through central Ohio. This column of zones is as follows:

	Feet
Zone H. Thin bedded to massive, bluish gray limestone. The upper few inches of the zone and formation, commonly called the "bone bed", contain a great number of small pointed teeth and a few fragments of bones and dermal plates of fish. The base of the zone is at many places a smooth parting plane.	10
Zone G. Massive, gray, fossiliferous limestone. The cephalopod genus, **Ryticeras** is especially characteristic.	22
Zone F. Massive, light gray, very fossiliferous, slightly porous limestone. Called **Spirifer gregarius** zone from the abundance of this species.	5
Zone E. Massive, gray, fossiliferous limestone. **Spirifer macrothyris** and **Strophonella ampla** are characteristic.	20
Zone D. Brownish gray, bedded limestone with nodules or thin layers of gray chert. At places the chert contains a large number of species of gastropods.	8
Zone C. Massive, brown limestone with many corals. The coral zone.	4
Zone B. Very massive, brown dolomitic limestone with few fossils.	35
Zone A. Brown limestone matrix, commonly with pebbles of Monroe dolomite and grains of quartz sand. Conglomerate zone.	1

The total thickness of the Columbus limestone as given in the above section is 105 feet. The thicknesses of the several zones vary from place to place as well as the total thickness of the formation.

A section showing all of the Columbus limestone with a few feet of the Delaware limestone above and of the Monroe dolomite below was exposed in the excavation for the O'Shaughnessy dam about 15 miles northwest of Columbus. This section, by zones, is given below and a cross section of the Scioto valley at this place is given as figure 3.

	Feet
Delaware Limestone—	
Bluish limestone in layers of 3 to 6 inches.	3+
Columbus Limestone, 87 feet—	
Zone H. Bluish gray, fossiliferous limestone in layers of 1 to 2 feet. The base is at a very smooth plane.	7
Zone G. Bluish gray, fossiliferous limestone in layers of 3 to 5 feet.	19
Zone F. Bluish gray, very fossiliferous limestone with **Spirifer gregarius** (Spirifer gregarius zone).	4
Zone E. Bluish gray limestone that weathers buff. In layers of 12 to 18 inches. Upper half fossiliferous.	14

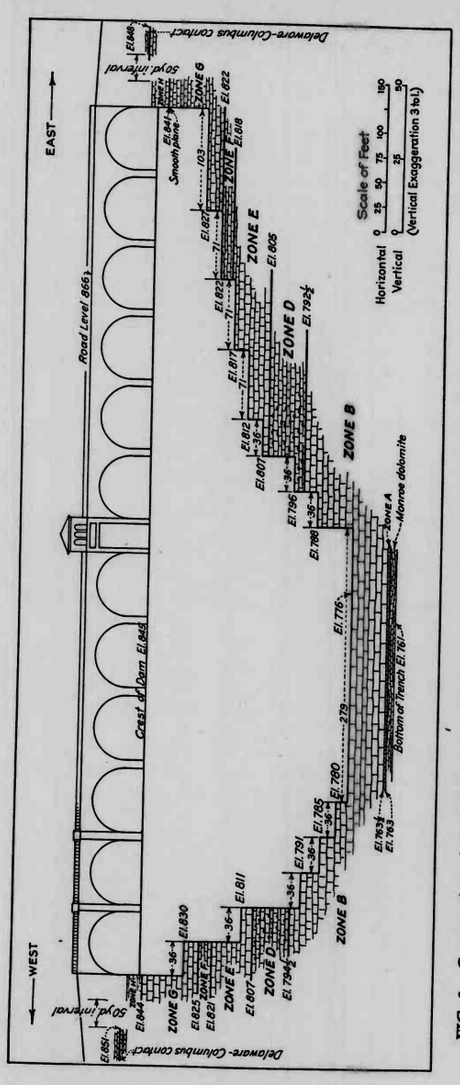

FIG. 3. Cross-section of the Scioto valley at the down-stream face of the O'Shaughnessy Dam, showing the location of the zones of the Columbus limestone with respect to the various rock benches.

Zone D. Grayish brown limestone with bands of chert nodules and some chert layers (Chert zone). Contains a number of gastropods....12½
Zone C. Missing.
Zone B. Brown dolomitic limestone with some banding and in thick ledges of 3 to 5 feet. The basal 8 feet is more compact and contains some sand grains.....30
Zone A. Arenaceous limestone matrix with pebbles of Monroe dolomite and chert (Conglomerate zone)..... ½

Monroe Dolomite—
Ashen gray to drab, laminated, argillaceous dolomite in beds of 2 to 8 inches. In part brecciated, with minute fragments..... 2+

The Columbus limestone is of mid-Devonian age, being the approximate correlative of the Onondaga of New York, the Dundee of Michigan and the Jeffersonville of Indiana. It contains a large marine fauna of about 425 species and in certain zones the fossils are abundant. However, they commonly exist as moulds of the exterior or interior, or casts of the interior space and it is difficult to obtain good fossils. Brachiopods and corals are commonly the most abundant. Probably the most interesting single layer is the "bone bed" at the top of the formation containing a great number of small fish teeth.

The Delaware consists of bluish brown, cherty, argillaceous, thin bedded limestone with a thickness of about 35 feet. The lower part is exposed at various places along the Scioto valley from Mable Cliff northward. This lower part is quite shaly and contains much black chert as beds and as nodules. Higher up in the formation a purer type of limestone exists. The areal extent of the formation is shown on the accompanying map (Fig. 2).

About 150 species of fossils have been identified from the Delaware limestone and the formation is far less fossiliferous than the Columbus limestone. Some of the species are forms persisting from the Columbus time, while other species show its relation to the Marcellus and Hamilton of the east.

The next overlying formation, the Olentangy shale, consists of blue, calcareous shale with a few thin layers of limestone, and in the upper part a few thin layers of black shale. Its thickness is commonly about 30 feet. Because of the non-resistant nature of the material, outcrops of this formation are few.

The Olentangy shale is practically without fossils in the Columbus region but farther northward in Ohio it does contain fossils which indicate a close relationship to the Hamilton shale of New York.

The Ohio is a black, rather massive shale where fresh but weathers to thin laminae. It generally shows two well developed systems of joints approximately at right angles to each other. It is far more resistant than the Olentangy shale below and exposures are fairly common in the north part of Columbus and northward along the Olentangy valley. Its areal distribution is shown on the accompanying map (Fig. 2). Eight miles east of Columbus where the Ohio shale is overlain by the next higher formation it has a total thickness of about 700 feet.

In the basal part of the formation, which is the part exposed along the Olentangy valley, there are a number of spherical, ferruginous concretions, commonly 2 to 3 feet across but in some cases 6 to 8 feet across. They exhibit well the growth of concretions in place, by the passage of the laminae of the shale into the concretion and by the displacement of the shale layers both upward and downward.

CHAPTER III.

FACTS ABOUT THE WEATHER AND CLIMATE OF COLUMBUS

WILLIAM H. ALEXANDER
Senior Meteorologist, United States Weather Bureau, Columbus

SIR NAPIER SHAW says: "I have come to the conclusion that if you want to know all about the weather of Uppingham or any other place on this earth you had better begin by looking at the weather of the world as a whole. The weather of any locality is only an incident in a very complicated turmoil of air which forms what we call the general circulation of the atmosphere, and if we want to understand any part of it we must have a working knowledge of the general system." Obviously, then, under the limitations imposed upon this discussion, we are not going to be able to tell **"all about the weather"**, or **climate**, for that matter, of Columbus. Note first of all, that we have set out to tell you some facts about both the **"weather"** and the **"climate"** of Columbus. The two are not the same by any means, though closely related. We will be mainly concerned with the latter.

Both weather and climate are very complex phenomena "subject to a complex control, all terms of which are more or less variable," the **weather** being simply a passing phase of climate, or the sum total of the atmospheric conditions, such as temperature, humidity, precipitation, clouds, winds, etc., prevailing at any give time and place, while **"climate"** is the "sum total of

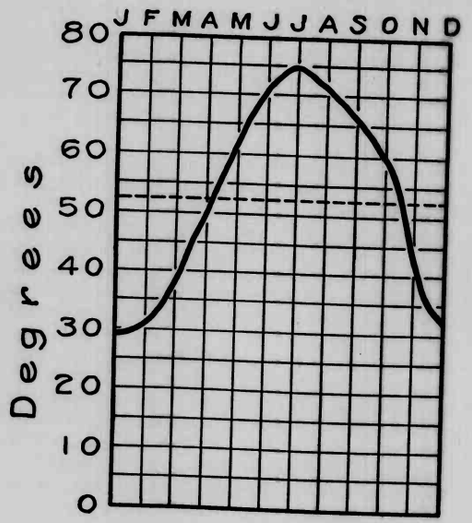

FIG. 4

Mean Temperatures by Months.

The horizontal line represents the mean annual temperature.

the weather as usually experienced during a longer or shorter period of time at any given season." Obviously the method used in describing **weather** is not applicable to a discussion of **climate**, even though the factors or elements are essentially the same in both. Meteorologists are not agreed as to what constitutes a **complete** list of climatic factors but all agree that the following are the **chief factors:** (1) temperature; (2) atmospheric moisture, including humidity, precipitation, cloudiness and evaporation; (3) atmospheric pressure, including the passage of cyclonic and anticyclonic areas; and (4) winds, including local storms such as thunderstorms, tornadoes, etc. Neither are climatologists agreed as to just when the climate of a given place or region has been **fully described**, but certainly such a description should give, as far as possible, the hourly, daily, monthly and yearly values of the chief factors.

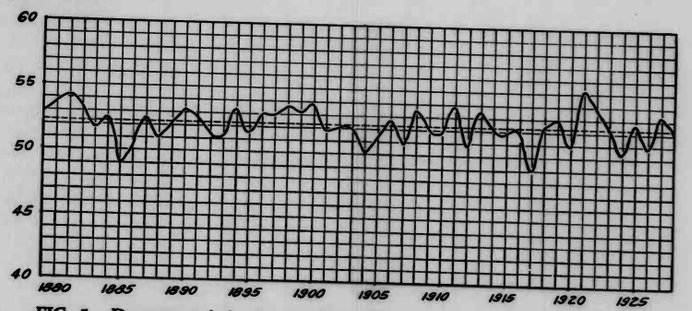

FIG. 5. Departure of the Annual Mean Temperature from the Normal for the Past 50 Years at Columbus. 1921 was the warmest year and 1917 the coldest. The mean annual temperature is represented by the broken line (52.3 degrees).

In the accompanying tables and charts will be found a tabulation of certain of the climatic elements and their values at Columbus. Note that certain of the factors which in the long run determine the average values of the climatic elements are constant while others are variable; chief among the **constant** factors are latitude, elevation above sea-level, the position of the place with reference to land and water areas and to the path of storm centers, and, to some extent, to the nature of the soil; these tend to give to a place a **fixed mean**; among the variable factors, are wind movement (direction and velocity), cloudiness, rain and atmospheric pressure; these vary from day to day and from season to season, and tend to produce a **variable mean.** In some parts of the earth, as in the tropics, these variable factors become almost constant and a very safe mean can be secured from a comparatively short record, but in other parts, as in the temperate zone, Columbus for example, these variables are quite large and therefore in order to obtain a mean of the required accuracy a long series of observations is necessary. The factor to which is due very largely the variety and changeable character of the weather in Columbus or Ohio is not latitude but nearness to the usual paths of the cyclonic storms that are constantly passing from the west, over the Lake Region and down the St. Lawrence Valley. In fact, many of the storms pass right over the State and are attended by rapid and, at times, marked changes in the weather factors.

	Mean Mo. and Annual (43 Yrs.)	Mean Depart. of the Means (43 Yrs.)	Mean Diurnal Range (43 Yrs.)	Mean Diurnal Variability (43 Yrs.)	Mean Maximum (43 Yrs.)	Mean Minimum (43 Yrs.)	Absolute Extremes (1878 to 1921)	
							Highest	Lowest
December	32.2	3.6	13.6	5.9	40.0	26.1	67	—12
January	29.1	4.8	14.6	7.0	37.4	22.4	72	—20
February	30.0	4.6	15.5	7.1	37.7	23.1	72	—20
March	39.9	4.0	17.1	6.6	49.4	32.0	84	0
April	51.0	2.0	19.0	5.7	61.9	42.5	90	15
May	62.2	2.8	19.4	4.7	72.2	52.2	96	33
June	70.9	2.0	19.8	3.6	82.7	62.4	99	39
July	76.9	1.9	20.6	3.2	87.1	66.5	104	50
August	72.8	1.8	19.9	3.2	84.7	64.3	103	42
September	66.5	2.4	20.4	4.2	78.6	57.7	98	32
October	55.0	2.9	19.2	4.8	66.0	46.4	90	20
November	41.9	2.3	15.5	5.5	50.7	34.9	77	—5
The Year	52.4	1.0	17.9	5.1	62.4	44.2	104	—20

FIG. 6. Temperature Data for Columbus. The mean departure from the means indicates the average variation that each month or the year experiences. The mean diurnal range is the difference between the coldest and warmest hour of the days. The mean diurnal variability is the average change from day to day. The difference between the mean maximum and the mean minimum gives the average range of temperature. But the absolute extremes, that is the warmest or coldest temperatures experienced, give the absolute range.

The diurnal variations in the temperature are very familiar phenomena and deserve more attention as a weather feature at any place than is generally accorded. These changes take place with great regularity for any given locality and depend largely upon the character of the surface upon which the rays of the sun fall. Over a water surface, for example, these variations would be very small, whereas, over a continental surface they would be very large, especially over a sandy soil where the air is dry. These variations are also influenced by the cloudiness of the place, by a snow covering and by the wind movement.

When one passes, however, from the study of temperature and temperaure conditions at a given station to those of large areas, such as the State of Ohio, for example, even though one meets with essentially the same factors, one finds some of them more complex and prominent, such as latitude and topography, both of which become more important in our discussion. We now have to consider broad and narrow river valleys, uplands and hills of varying elevation and ruggedness, and a considerable lake shore. The absolute maximum temperature for the State, all available records considered, is 113° at Thurman, Gallia County, July 4, 1897, and the absolute minimum, 44° at Laceyville, Harrison County, February 10, 1899. Note that both extremes occurred in the southeastern part of the State.

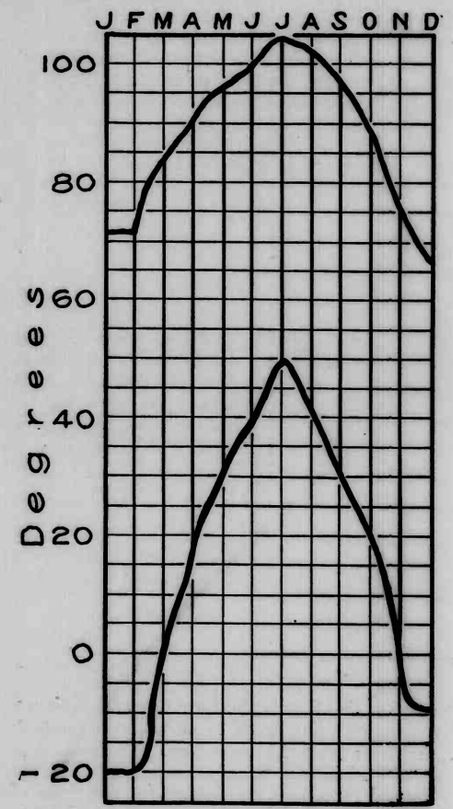

FIG. 7. The Highest and the Lowest Temperatures Experienced since 1878. The heavy vertical lines therefore represent the absolute temperature ranges for each month.

Assuming that spring has arrived when the daily mean temperature reaches 44° or higher, we find that spring makes its first appearance in the extreme southern part of Adams County on or about March 10, that it advances northward rather slowly at first not reaching the middle sections of the State until near the end of March; and that it reaches the more elevated portions of the northern sections during the first decade of April.

In addition to the regular daily temperature changes just noted above, Ohio experiences, at times, other very important though irregular changes of temperature incident to the passage of cyclonic and anti-cyclonic areas over or near the State. These, under certain conditions, are called "heat waves" or "cold waves" and may cause very great suffering and loss.

The type of precipitation through the year in Ohio is a **composite** one; it resembles somewhat the Plains states type in that the maximum amount is in early summer; it resembles the Gulf type in that there is an abundance of precipitation during the winter months; and it approximates the St. Lawrence Valley type in that there is great uniformity of precipitation throughout the year. The average annual precipitation for the State as a whole is

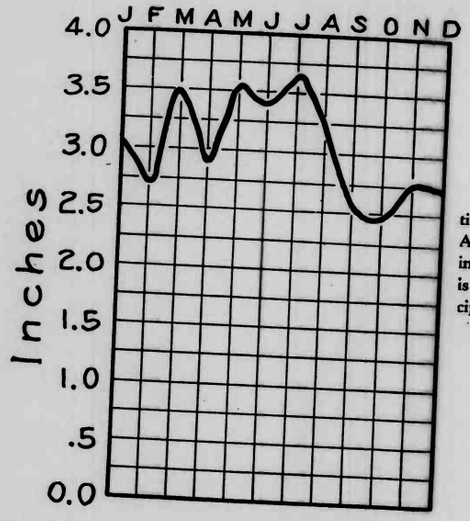

FIG. 8. Mean Precipitation by Months. The Mean Annual Precipitation is 36.36 inches. The Mean Snowfall is 24.1 inches, falling principally in three months.

37.49 inches. A large percentage of this falls in the form of snow, the average snowfall over the southern section being about 23 inches, over the middle section about 30 inches, and over the northern section, 38 inches. The wettest year of record was 1890 when the State average reached 50.33 inches; the driest year was that of 1856 with an average for the State of only 28.02 inches. The greatest average precipitation for any month, considering the State as a whole, was 8.67 inches in September, 1866, and the least monthly average was 0.26 inch in March, 1910. The yearly precipitation may be divided among the four seasons as follows: viz, autumn, 7.94 inches; winter, 8.22 inches; spring, 10.22 inches; and the summer 11.11 inches. The precipitation regime in Ohio is what is known as the **continental interior regime,** that is, "most rain in summer; winters less rainy but not rainless." The precipitation in Ohio is mainly of two distinct types: one, the convectional or thunderstorm type, is characterized by heavy showers of short duration, occurring usually during the hottest part of the day and year; the other is known as the cyclonic type in which the fall occurs irrespective of the time of day and is not, as a rule, so heavy, but often lasts longer than the convectional type.

Then another thing to be kept in mind is that the geographical location of Ohio with reference to the normal storm tracks causes the State to come under the influence of the southern quadrants of many of these passing storm-areas where conditions are favorable, especially during the warmer months of the year, to the development of numerous local storms, such as thunderstorms, hailstorms, windstorms, heavy rainstorms and now and then a tornado. The heaviest rains and the high winds are incident to one of these local storms. As a rule 40 or more thunderstorms may be expected during the year at any given station, about half of them occurring during the summer months of June, July and August ,with the maximum number in July.

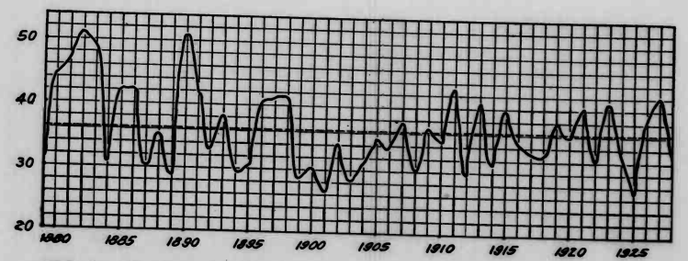

FIG. 9. The Departure of the Annual Precipitations from the Normal for the past 50 years, at Columbus. Some years are very wet while others seriously dry. The mean annual precipitation is indicated by the broken line (36.36 inches).

During the 25-year period, 1902 to 1926, inclusive, dense fog was recorded at Columbus on 38 days in January, 48 days in February, 17 days in March, 14 days in April, 6 days in May, 4 days in June, 6 days in July, 8 days in August, 15 days in September, 29 days in October, 31 days in November and 34 days in December, 250 days in all, which is an average of 10 dense fogs per year. From October to March, the fogs usually occur between 4 and 10 a. m. and during the summer months almost entirely during the night time.

Most of the data contained in this paper are taken from "A Climatological History of Ohio" by the writer, the tables in the main being taken bodily from that publication. The graphs were prepared by Mr. Arnold E. McKenzie. Both tables and graphs are self-explanatory and are based on official records.

CHAPTER IV.

ORIGINAL VEGETATION OF THE REGION ABOUT COLUMBUS

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ORIGINALLY the region about Columbus was a dense forest broken only by occasional small prairies. But within the area there was a dividing line, a tension line, between two types of forest. On one side of this line was a forest characterized by the beech tree and the maple tree. On the other side forest trees were predominately of the oak and hickory. What is said following is best read by frequent reference to the accompanying map.

With respect to the original vegetation Columbus is located on a tension line between Maple-Beech forests and Oak-Hickory forests, which stretches from Bellefontaine on the northwest to Laurelville on the southeast. Among the Beech-Maple forests north, east, and southeast of Columbus were scattered patches of the several phases of Swamp Forest occupying perhaps a fourth of the total area. Among the Oak-Hickory forests which occupied most of the well drained upland west and south of Columbus, were extensive area of Big Bluestem Prairie, Bur-Oak Forest, and in Pickaway County, Swamp Forest. Locally on sand and gravel hills in Madison County were dry "Oak Openings", characterized by Post Oak, Hazel and Little Bluestem. In certain areas the tall Bluestem prairies of prehistoric times had been succeeded by Bur-Oak Forests, in other, perhaps wetter areas by Swamp Forests when the region was settled by white men. It should be noted that on the tension line between Beech-Maple and Oak-Hickory there is a belt of Oak-Hickory—Maple forest of varying width, and that this belt cuts across drainage lines, topography, geological formations, and appears to be quite independent of soil types. Oak-Hickory Maple forest also occurs along the bluffs of streams in the southeastern portion of the Oak-Hickory forest area.

The most important trees of the Beech-Maple Forests are Beech, Sugar Maple, American Elm, Red Oak, Shagbark Hickory, and White Ash.

The characteristic trees of the swamp Forest are American Elm, Black Ash, Red Maple, Silver Maple, Pin Oak, Swamp White Oak, Shagbark Hickory, Bitternut Hickory, White Ash, Bur Oak and Red Oak.

The Oak-Hickory forest is composed of White and Black Oaks, Shagbark and Pignut Hickory, less frequently Scarlet, Bur, and Shingle Oaks, Sassafras and Persimmon. "Oak Openings" were excessively drained sand and gravel areas where Post and Shingle Oaks together with White, Scarlet and Black Oaks form open stands with an undergrowth of Little Bluestem and scattered clumps of Hazel and Wild Plum.

Oak-Hickory-Maple forests contain many of the species of the Oak-Hickory and the Beech-Maple except the Beech.

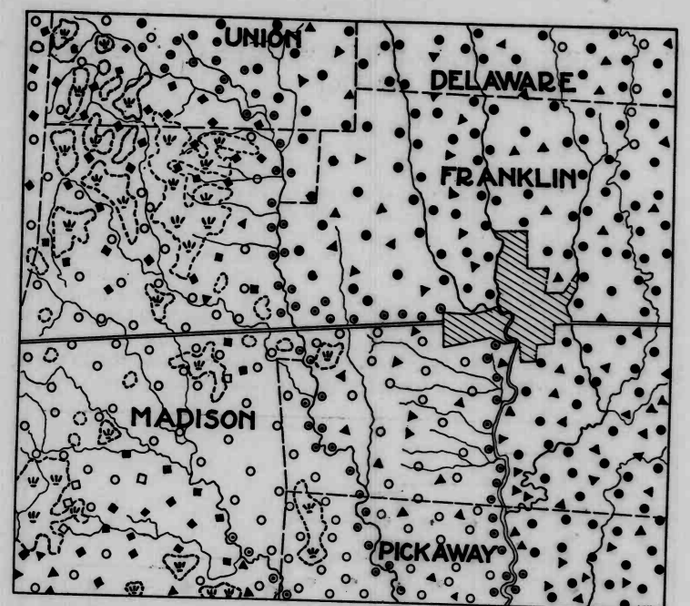

FIG. 10. Original Vegetation of the Region about Columbus, by E. N. Transeau and H. C. Sampson.

Solid circle—Beech-Maple Forest
Circle with dot—Oak-Maple Forest
Circle—Oak-Hickory Forest
Hollow square—Oak Openings Association
Triangle—Swamp Forest
Solid Square—Bur Oak Forest
Three lines above a line—Prairie Association.

The Bur Oak Forest consisted of open groves sometimes of nearly pure stands bordering the prairies but varying in dry situations to include scattered individuals of the Oak-Hickory, or in wetter situations of the Swamp Forest.

The drier phases of the Prairie were characterized by Big Bluestem and Indian Grass, Prairie Dock, Rattle Snake Master, Sullivant's Milkweed, Rigid Goldenrod, Saw-tooth Sunflower and Gray-headed Coneflower. The wetter phases of the Prairie were dominated by Cordgrass, Tall-Smooth Panicum and Calamagrostis. Within the Prairie were also marshes dominated by Cattails, Bulrushes and Reed Grass.

CHAPTER V.

THE AGRICULTURAL RESOURCES OF CENTRAL OHIO

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Our capital city, Columbus, is located in the center of a highly developed, diversified, and prosperous agricultural area. Within a radius of twenty-five miles of its urban limits, including all of Franklin county and the greater portions of bordering counties; namely, Delaware, Licking, Union, Madison, Pickaway, and Fairfield, there is an annual production of crops valued at approximately $25,000,000 or about 10 per cent of the total value of crops grown in the State of Ohio. This fact is of considerable significance when it is recalled that Ohio ranks about tenth among the States of the Union in value of farm crops. In addition to crop products, the livestock commodities in this central area of Ohio have an average yearly value of

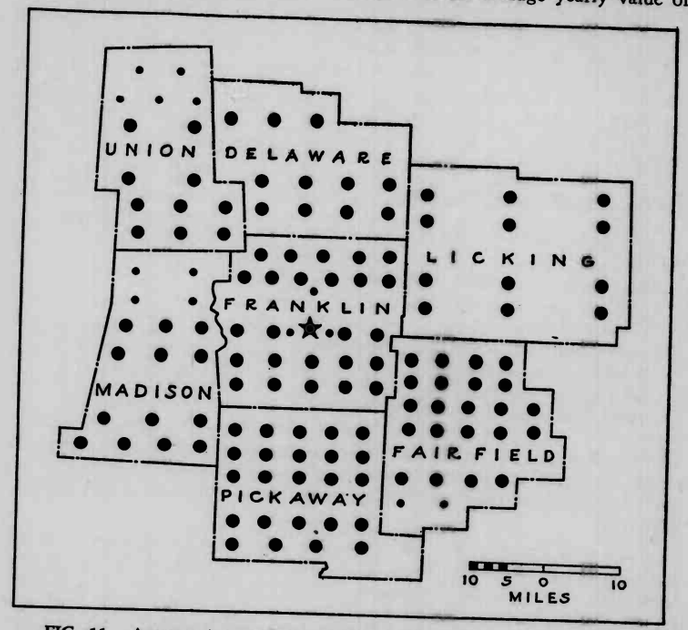

FIG. 11. Average Annual Value of Wheat Harvested in Central Ohio, 1924-1926. The large dots represent an average annual value of $50,000 and the small dots $5,000.

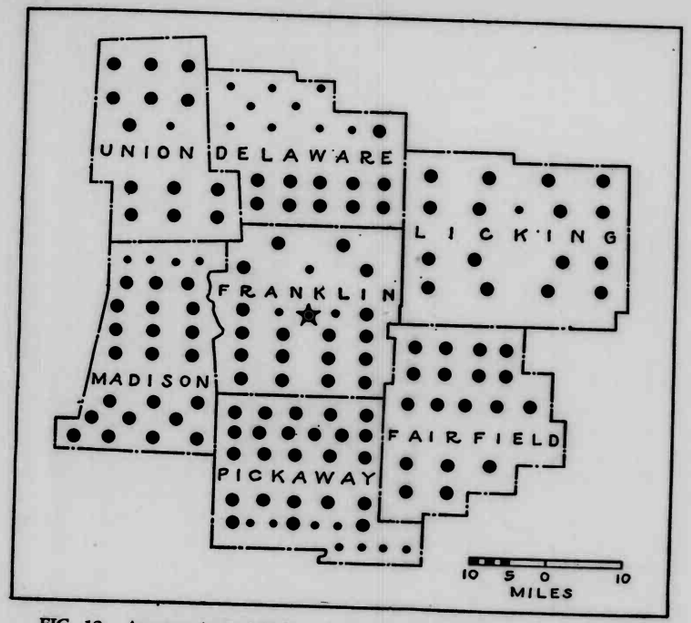

FIG. 12. Average Annual Value of Corn in Central Ohio, 1924-1926. Large dots represent annual value of $100,000 and the small dots $10,000.

$10,000,000. The effects of this agricultural wealth are expressed not only in the high standards of living on the farms but they also influence the business conditions in Columbus and adjacent towns.

The rural landscape of Central Ohio reveals the true wealth of its agricultural resources. In season, extensive fields of corn, wheat, and oats, are found everywhere (Figs. 11 and 12). On the succulent pastures, pure bred cattle are grazing (Fig. 15). Swine and sheep are also raised in great numbers (Fig. 14). Truck gardening represents another important activity of this area. Modern buildings and efficient farm implements and machinery are universal. As a whole, well-kept hedges or fences mark the boundaries of the individual farms. Accessibility is a pre-eminent geographic factor of this region. Excellent roads radiate in all directions. Less than 5 per cent of the roads in Central Ohio are unimproved—a characteristic, however, that prevails throughout the Buckeye State. Main arteries or highways, built of macadam, brick, or concrete give access to neighboring counties and States. No state has more good road-building material.

Farms of moderate size predominate. About 30 per cent of the farms have an area of 500-100 acres and 20 per cent consist of 100 to 174 acres. There are only 12 farms in the entire area of Central Ohio under 3

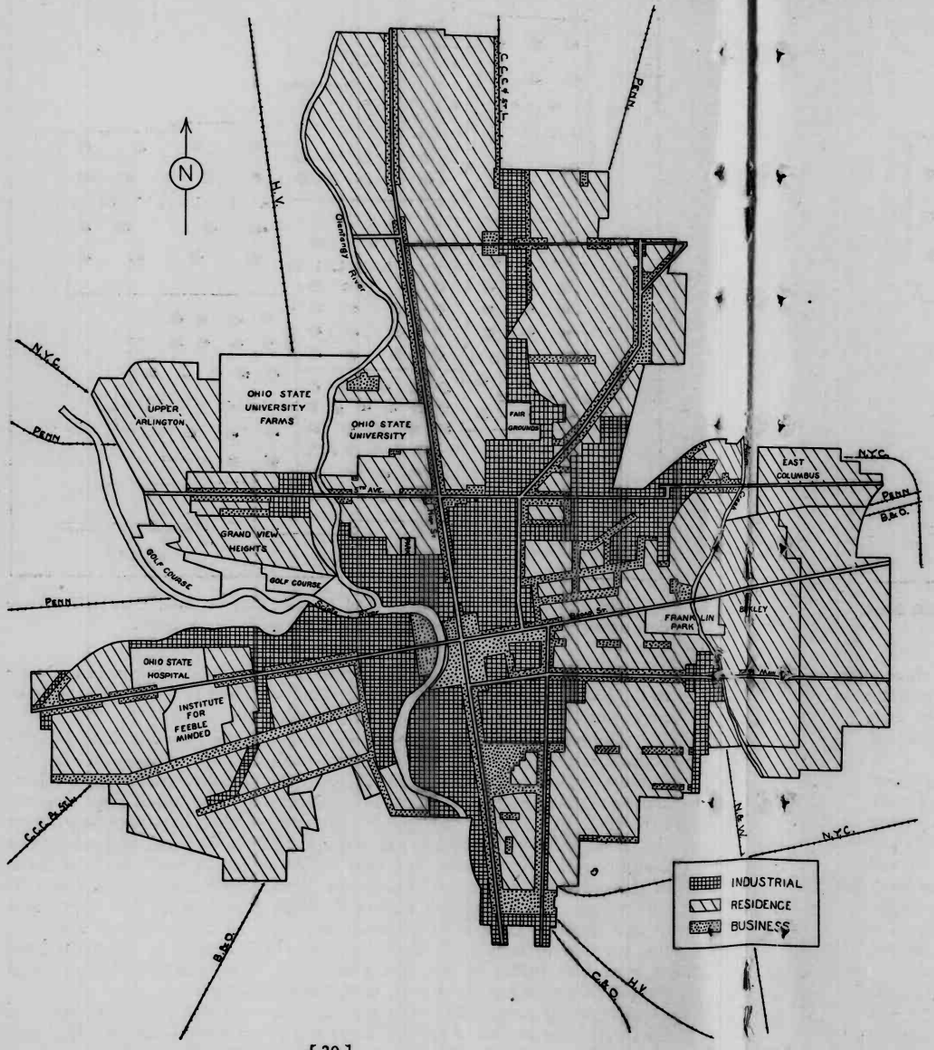

FIG. 13. Land Utilization within Columbus. This figure is to accompany Chapter VIII, The Industrial Growth of Columbus. The map is designed to stress the amount of area which within limits of the city may be devoted to industrial purposes. This map shows the tendency of the city to grow along the two cross roads, High Street and Broad Street. Were the outlying villages included on the map the cross shape would be even more pronounced. Note that the village of Bexley is almost entirely surrounded by Columbus.

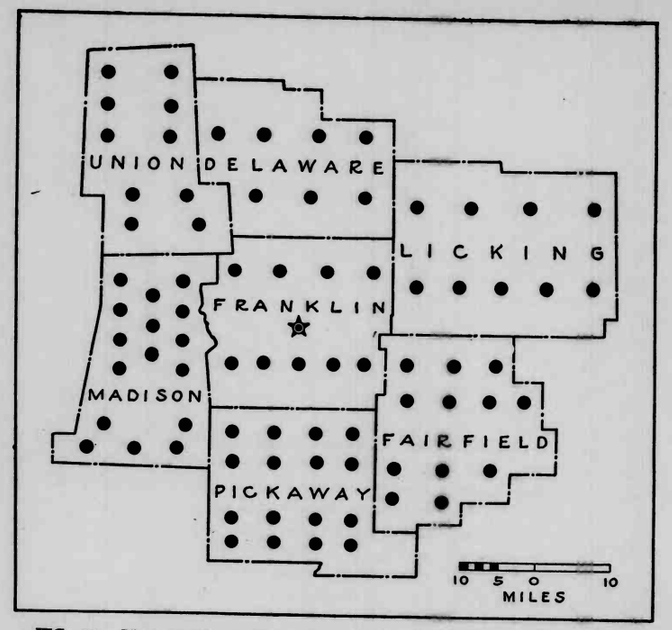

FIG. 14. Hogs on Farms, January 1, 1926. Each dot represents 4000 hogs. After Ohio Experiment Station, Bulletin 409.

acres and none over 5000 acres. However, throughout this region there is a growing tendency to reduce the size of farms. This movement indicates that there is an increasing desire on the part of the farmers to become land owners. Today, approximately two-thirds of the farms in Central Ohio are operated by owners.

The value of the farm lands and buildings in Central Ohio is another indicator of agricultural wealth. It is reported in the United States Census of Agriculture, 1925, that there is an approximate value of $200,000,000 of farm lands and buildings and nearly $10,000,000 of farm implements and machinery in this central agricultural area of Ohio. Again, a striking amount when compared with the statistics for the entire State. Ohio's farm lands and buildings for 1925 were valued at $1,945,630,975 and her farm implements and machinery were valued at $97,892,575 for the same year. The interest on these investments is measured first in farm products and second, in the comforts of individual homes.

The major farm products of Central Ohio that are sold in the Columbus markets, may be classified into; (1) livestock products; (2) staple crops, and (3) truck products. The greater percentage of the farm products originating in Central Ohio are marketed in Columbus. The authors of a recent report

say that "forty per cent of the produce trucked into the Columbus wholesale curb market during the last six months of 1928 originated in Franklin county. During this period 44 Ohio counties were represented on this market, furnishing amounts of produce ranging from one to 4062 truckloads. The largest amount from any county in a single month came from Franklin County in August, when 1436 truckloads aggregating over two million pounds of produce from this area were offered on this market."

The geographic factors that enter into the utilization of land for agriculture are (1) the location elements such as position, area, and accessibility, (2) climate, (3) topography, (4) soils, and (5) man. These factors are inter-related and inter-dependent.

The favorable location of Central Ohio as defined in the word **central** is a geographic circumstance of utmost importance. Irrespective of the resources that the region may have, it would nevertheless be important because of its central position. It is accessible and of equal distance to nearly all parts of Ohio which must necessarily add to its value. In being located around the industrious and progressive city of Columbus where there are more than 300,000 inhabitants, Central Ohio is assured of a potent and growing market.

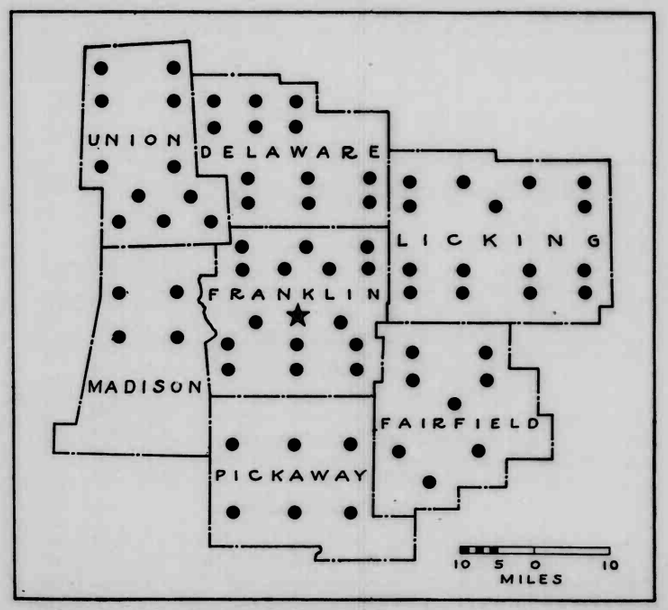

FIG. 15. Dairy Receipts of Central Ohio. Each dot represents $400,000. After Bulletin 27, Ohio Geological Survey.

CHAPTER VI.

MINERAL RESOURCES AND INDUSTRIES OF OHIO

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THE mineral resources of Central Ohio are represented by the extensive limestone quarries to the northwest of Columbus. On the other hand, the city is profoundly affected by the mineral resources and industries of the state as a whole. Coal, and gas from local mines and wells are reflected in cheap fuel; the brick and tile industries mean lower building costs; the limestone from the very gates of the city is used in building and road construction and in the city's steel mills.

Among the leading mineral producing states of the country, Ohio ranked sixth in 1925 according to the value of the product, being exceeded only by Pennsylvania, Oklahoma, California, Texas, and West Virginia, in the order named. Ohio's mineral production that year was $247,506,588. Yet, on the basis of wage and salary payments, Ohio's mines and quarries accounted for less than 3% of the total wage and salary payments of the eight major divisions of industry and commerce of the state, being exceeded, in the order named, by manufacture, wholesale and retail trade, service, construction, transportation and public utilities.

The nature and rank of the most important mineral industries of the state are suggested in the following table:

Value of Output of Chief Mineral Industries of Ohio in 1925[1]

Product	Value
Clay Products	$97,991,821
Coal	54,057,000
Natural Gas	22,377,000
Petroleum	17,200,000
Lime	10,970,605
Limestone	9,617,437
Portland Cement	9,600,084
Sand and Gravel	8,252,913
Gypsum	5,620,099
Salt	4,116,625
Sandstone	3,467,135
Grindstones and Pulpstones	1,065,301

Clays and Ceramic Industries

In the foregoing table, clay should, in fact, be ranked second, as the value stated represents the products manufactured from clay. The cost of the raw material so used represents only about 30% of this value. When to this is added, however, the Ohio clay furnished to industries in other states

[1] "Mineral Resources of the United States," 1925, Parts I and II.

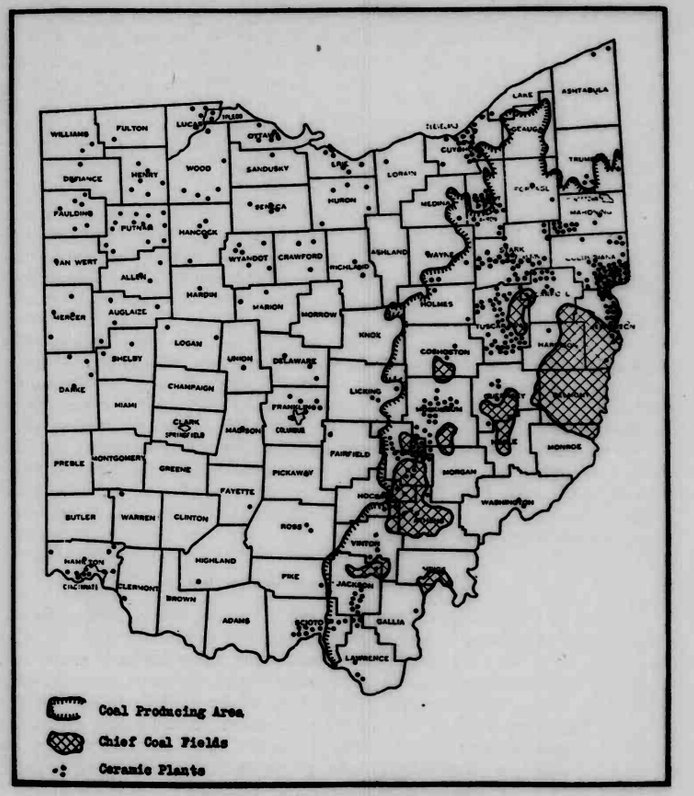

FIG. 16. Coal and Clay Resources.

for the making of terra cotta and other clay products, the value of the state's annual output of this mineral resource is seen to be more than $35,000,000. As raw materials for the ceramic industries, Ohio's deposits of clays and shales are practically unlimited. In this respect, Ohio's clay may be said to rank above her coal; for of course the latter, although underlying 12,340 square miles or nearly 30% of the area of the state, is after all an exhaustible resource and not restorable. The importance of nearby cheap building materials is reflected in building costs in Columbus.

The **common clay**, abundant in the alluvial valleys and in the glacial drift of western Ohio, the **shales** found generally throughout central and eastern Ohio, and the **buff-burning** clays of the coal-bearing area of the eastern and southeastern part of the state, furnish the material for Ohio's 490 ceramic plants, whose annual product is now well over $100,000,000 a year

In this group of industries Ohio ranks first in the United States. The three largest of the ceramic industries of the state are: **art pottery and specialties,** with 69% of the entire output of the United States, and including such famous names as Rookwood, Roseville, Cowan, Sebring, and Weller; **tableware,** of which Ohio turns out 56% of the country's product, and proudly points to many of the names found on some of the most beautiful of modern table china, such as, Hall, Carrollton, Coxon Belleck, Pope-Gosser, and Homer-Laughlin; and, less artistic but high utility, Ohio's **sewer pipe** output totals 43% of the total for the United States.

Beside these three, Ohio also holds first place in the Union in six other ceramic industries, namely: **electrical porcelain,** with 36% of the nation's production; **drain tile,** with 30%; **stoneware** and **red earthenware,** 30%; **paving brick,** 26%; **structural clay,** 23% and **face brick,** 22%. The remaining ceramic industries of Ohio are refractories, glass, and sanitary ware, each with 11%, and common brick with 4% of the total production of the United States. Among the latter, the fire clay industry alone is now represented in Ohio by twenty-two firms and thirty plants, chiefly in the eastern and southeastern parts of the state. In 1926 Ohio's fire clay production was 3,692,600 tons. In East Liverpool, Ohio, one of the country's two greatest pottery centers, are located some of the largest china manufacturing plants in the world. The pottery industry there began twenty years before the Civil War. Ohio's foremost position in the manufacture is due, among other things, to the early introduction of the art here as well as to the wide distribution of suitable clays (Fig. 16). Columbus has its share of the administration and distribution of clay products.

Coal Resources and Production

Great as Ohio's clay output has been, however, it has, neither in tonnage nor in value, approached anywhere near her production of coal. Coal occurs in 31 of the 88 counties of the state, but the production shows considerable concentration, one-third coming from Belmont county alone (Fig. 16). Four counties produce some 70% of the total, and eight counties account for about 90% of the state's production. Ohio's coal production reached a peak of more than 47 million tons in 1918. Since then there has been a big slump in the production due partly to unsatisfactory prices, partly to labor difficulties, and partly to the fact that during the time of great demand and high prices resulting from the Great War, many mines were opened without adequate financing and without proper screening and cleaning equipment, thus leading to unsatisfactory conditions. Most of those mines have since been abandoned, however, and many companies have been spending thousands of dollars installing modern cleaning machinery to produce a higher grade, cleaner coal, so that now Ohio is producing the best coal ever mined in the state. Increased demand for Ohio coal and renewed production are already in evidence, according to Mr. E. W. Smith, chief of the Ohio Division of Mines and Mining, who stated early in November that the coal production of Ohio for the first ten months of 1929 exceeded by nearly a third the output for the entire year of 1928. Not a little of the coal of Ohio is marketed through Columbus concerns.

All the Ohio coals are bituminous and practically all are steam coals. Every type of Ohio coal is used for domestic purposes, the choice being

chiefly a matter of market conditions. The coal area is in general the hilly section of Ohio, and in many places the coal outcrops in valleys or along the sides of the hills. Then, too, the eastward dip of the strata is slight and the coal is carried below drainage only gradually so that deep shafting is as yet unnecessary except in a few places. Consequently, the coal is unusually accessible. Moreover, these coal fields are well supplied with railroads, and the Ohio River, with improved navigation facilities, flows along their entire eastern and southern boundaries providing good shipping facilities. Conservative estimates indicate that in terms of minable coal seams at least three feet thick, run-of-mine coal, Ohio has so far used only about 12% of her total original minable coal of 15 billion tons. That this is conservative is evidenced by the fact that Mr. Frank R. Clark of the U. S. Geol. Survey

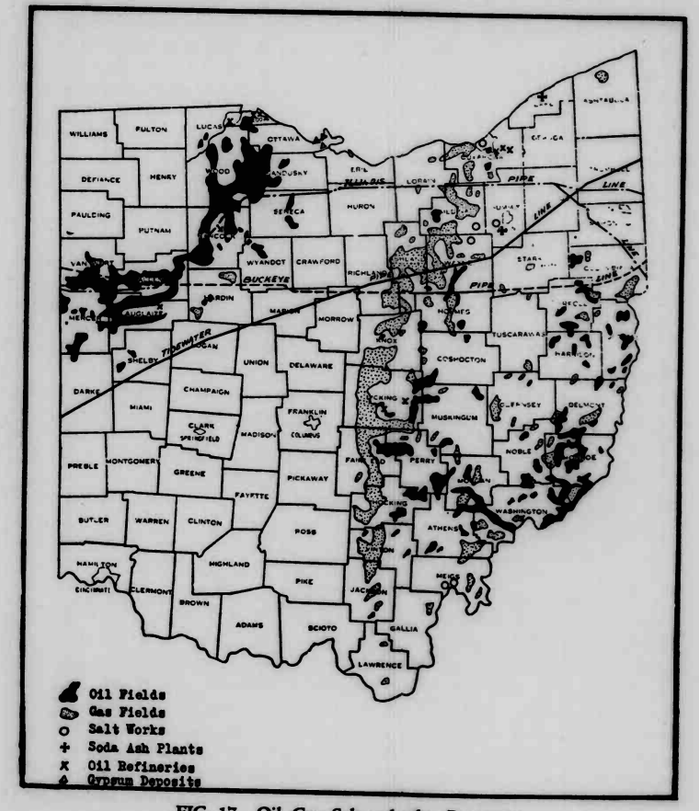

FIG. 17. Oil, Gas, Salt and other Resources.

estimated in 1917 that Ohio's total original tonnage of coal was in round numbers more than 87 billion short tons. The importance of such extensive coal deposits near the city need not be stressed. Cheap coal has profoundly affected the economics of local industry.

Oil and Natural Gas

Next to coal in the mineral fuel resources of Ohio come natural gas and petroleum. Unfortunately, both of these are rather quickly exhaustible resources, and in Ohio have already passed their production peaks and are now on the decline. In 1896 Ohio's petroleum production was nearly 24 million barrels and in 1900 it still was over 22 million barrels. After that it gradually declined, but for the last ten years the output has ranged around 7,000,000 barrel a year. Columbus is the home of numerous oil companies. Of natural gas, Ohio produced in 1926 over 47 billion cubic feet, with a value of $25,403,000. But large as that amount is, it is less than half the state's consumption. For this resource Ohio has already begun to draw upon neighboring states, mainly West Virginia (Fig. 17). Natural gas is piped to Columbus. The ample supply is used for factories, the heating of homes and for cooking. This fuel has reduced living costs in the city.

Other Mineral Resources

In strong contrast with the exhaustible resources of oil and natural gas, Ohio's natural resources of limestone and sandstone are practically unlimited. The same may be said of sand and gravel. Ohio's supplies of grit for grindstones are also great and the production of gypsum and salt runs into millions of dollars. In salt production, Ohio exceeded only by Michigan and New York; while in 1926 the state ranked fourth in the output of gypsum, the tonnage being 525,483 with a value of $5,620,099.

Limestone being the underlying rock of the west half of Ohio, many quarries are scattered throughout that part of the state. The bulk of the production, however comes from the tier of countries extending from Columbus north to Lake Erie. In 1926, Ottawa county led with an output of 1,823,992 tone; but Franklin county, in which Columbus is located, was a close second with 1,741,535 tons. Lucas county was third with 1,550,078 tons, Erie fourth with 1,534,846 tons, and Sandusky fifth with 1,458,506 tons. Next, in the same tier of counties came Seneca with 803,868 tons, but no other county had as much as 650,000 tons (Fig. 18).

The limestone is used for lime, building, macadamizing, paving, fluxing, cement, piers, concrete, agriculture, refractory and other purposes. The "Marble Cliff Quarries Company" of Columbus, Ohio, has been one of the most complete quarries in the United States. It now produces limestone for all purposes, including washed limestone sand, ground agricultural limestone, asphalt filler dust, whiting, rock asphalt, burned lime, and hydrated lime. After nearly two years of experiment and development, this company is now turning out in quantity production its new light cement, which has a quick set, and an early structural strength that increases so gradually that a non-shrinking mortar is the result, thus guaranteeing against leaking joints and wet walls due to shrinkage.

FIG. 18. Payroll in the Limestone Industry.

Limestone quarrying represents the mineral industry of the city. During the year ending December 31, 1928, Franklin County, in which Columbus is situated, produced 1,611,977 tons of limestone, this county ranking third in state, being exceeded only by Ottawa and Erie counties. This output for Franklin County was however, a little less than that for 1927 when the producing was 1,786,675. The extent to which these state resources play a part in the industrial life of the city is illustrated by Chapter VIII.

CHAPTER VII.

THE HUMAN RESOURCES OF COLUMBUS AND ENVIRONS

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COLUMBUS stands on the plain not far back from the break in the landscape which marks the beginnings of the rugged hill country of the Appalachian Plateau. When the first white men broke through the hill country of the east, to no small extent the route was down the Ohio River. At the mouths of the Muskingum, Scioto and Miami rivers these pioneers turned northward into the fertile Ohio country. In the early days there were three settlements in the territory—along the three valleys. It was the three settlements that accounted for the establishment of three state universities. The fertile Scioto valley came to have its population concentrated at the junction of the river and the great east-west artery, the National Road. Moreover this site proved to be the almost exact geographical center of the State. Columbus serves more than the vicinity. In politics, education and many other fashions it serves the state until its population today considerably exceeds 300,000 souls and the city's growth can only be guessed. Columbus is more than the capital of a wealthy state; it is more than a university town; it is more than a prairie village; it is a large city at the eastern edge of the agricultural middle west, thus the west and the east have contributed to its growth.

It is natural that Columbus should inherit some of the value of its strategic location from the geographical position of Pittsburgh. Had the junction of the Allegheny and Monongahela Rivers been much farther north in Pennsylvania there would still have been the need of a metropolitan center at the margin of the plains where the trans-Appalachian lines of communication break through. Therefore Columbus must look beyond the confines of its local environment to find the explanation of its growth to the fourth largest city in the state—being exceeded by Cleveland, Cincinnati and Toledo.

When the National Highway was being extended westward Columbus occupied a position along the projected line. Up along the Scioto Valley was constructed a branch of the Ohio-Lake Erie canal and during the canal period Columbus played an important part. With the coming of the railroads and later the auto roads and now the airways Columbus finds herself not necessarily focusing these lines of communication, but discovers herself at the natural focus of these ways of commerce. This explains why Columbus is a metropolitan community, but as yet not too cosmopolitan in composition.

The city had in 1920 a large native population numbering 220,844 or 93.2 per cent of the total. This does not indicate that there were also 22,181 negroes in the city, of 9.4 per cent of the population. At the last census enumeration Cleveland had 30.1 per cent foreign born and 7.5 per cent colored indicating that Columbus stands in a position to tap the northward stream of negroes, while Cleveland draws its labor supply from the immigrants.

Among the foreign-born in the city the Germans numbering 4,098 in 1920 ranked first, the British second, Italians third and Russians fourth. In

1900 the Germans made up 51.1 per cent of the total foreign born but by 1920 this proportion had decreased to 25.3 per cent. The large native population has had some effect upon retail stores, and it is related that one of the large department stores makes a special effort to employ sales people who are native Americans.

The accompanying map taken from the Geographical Review fails to indicate that Columbus has its satellites or lesser luminaries such as Bexley and Upper Arlington, excellent residential suburbs. Both to the north and the east of the city there seems to be an increased density along the principal thoroughfares, and to the southward market gardening along the Scioto River has concentrated the people into a more or less compact community. Unfortunately the map symbol for Columbus is so large that it extends beyond the corporate limits of the city, making it impossible to show accurately the population conditions.

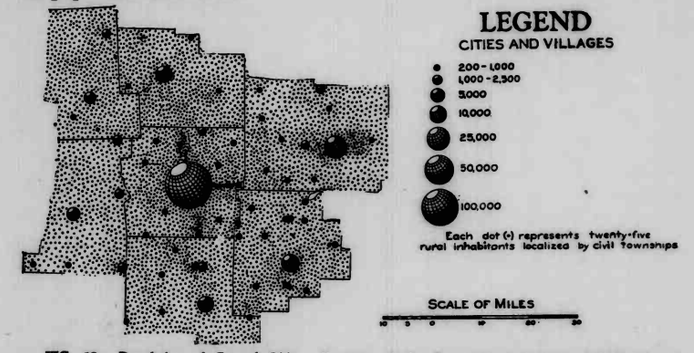

FIG. 19. Population of Central Ohio. Courtesy of the Geographical Review, published by the American Geographical Society of New York.

One of the important limitations on urban growth is the supply of potable and industrial water. For Columbus it has been estimated that the O'Shaughnessy reservoir will meet the requirements for many years to come.

Population	Million Gallons Daily	*Days of Supply
280,000	26	280
300,000	28	260
322,000	30	240
375,000	35	210
430,000	40	180
485,000	45	160
540,000	50	145

*without any run-off from rainfall.

The accompanying table containing various population estimates with the probable daily consumption indicates that a population of 540,000 consuming 50 million gallons per day would require 145 days to empty the reservoir. This does not include the additions by rainfall in the catchment basin, or the large supply impounded by the Griggs Dam, constructed before the O'Shaughnessy reservoir. Droughts of more than a few weeks are not to be expected in central Ohio, so it is obvious that the present supply of water is adequate for the needs of the city even if the population is doubled, and perhaps doubled again. The slowing down in population growth when that period comes will probably be due to other causes than an exhaustion of the supply of water.

CHAPTER VIII

COLUMBUS AS AN INDUSTRIAL CITY

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CAPITAL cities generally are not noted for their industrial development or commercial activity, but Columbus stands as one of the few exceptions. While not to be rated as a Pittsburgh or Gary yet it presents an industrial physiognomy, so to speak, which many urban centers not serving as state capitals would be happy to boast about.

The extent to which the city is industrial is evidenced by the nature of its payroll. Manufacturing industries and construction work together make up about 40 per cent of the total payroll. This payroll includes those of the national, state, and local governments, the city schools, and railroads in interstate trade. These last several groups absorb about 25 per cent of the total payroll. If we compare the industrial payroll with the total, after excluding these groups, then we find that it equals about one-half of the total. These figures certainly point to the industrial trend of Columbus.

Columbus is not a center dominated by a single industry nor is it characterized by numerous establishments producing similar commodities. It supports a considerable variety of industries. A mere listing of them includes such groups as iron, steel and their products, food products, boots and shoes, ceramic products, and lumber. Specialties, such as artificial teeth, motion-picture screens, dumb waiters, auto tire covers, and vanilla extracts are of interest as illustrating a few among many commodities normally not cited among a city's manufactures but which nevertheless contribute in an important way to the sum-total of the community's industrial development.

The groups of industries in Columbus ranked with respect to the ratio between their respective payrolls and the total payroll of all manufacturers is as follows:

1.	Iron, steel and machinery	29.0 per cent
2.	Food products	12.0 " "
3.	Leather products	10.0 " "
4.	Paper and printing	10.0 " "
5.	Vehicles and parts	8.0 " "
6.	Textiles	6.5 " "
7.	Stone, clay and glass	6.0 " "
8.	Lumber products	5.0 " "
9.	Chemicals	3.5 " "
10.	Non-ferrous metal products	3.0 " "
11.	Miscellaneous	7.0 " "

Group 1, namely iron, steel and machinery, is marked particularly by the manufacture of coal-cutting machines, belt conveyors, railroad cars, furnaces and stoves, cement mixing machines, roller bearings and foundry products. Here is located the country's largest manufacturer of mining machinery, a producer of road building machinery and a manufacturer of oil derricks, whose products reach practically every nation which can make use of such devices. Group 2 incorporates among other products those of the packing industry. Although Columbus is not to be classified with Chicago or Omaha as a packing center nevertheless it holds an important position in this part of the country. In the early history of the United States when the packing industry moved westward following close upon the settlement of the country, Columbus became one of the leading pork packing centers. However, during the last half century it has had to relinquish its high rank in favor of points farther west, but nevertheless the centrality of its location and richness of its agricultural environment have enabled it to maintain some prestige in this industry. Columbus still ranks high among the cities of the state in the meat packing industry.

In group 3 a noteworthy industry, associated originally with the presence of packing plants, involves the manufacture of shoes. About 40,000 pairs are produced daily, giving Columbus a ranking with Cincinnati and Portsmouth, as one of the three major shoe centers in the state and outstanding in the United States. Nearly one-fourth of those engaged in the shoe manufacturers of the state are employed in Columbus. The greater part of the production is in low priced footwear.

Group 5, namely, vehicles and parts, recalls the days before the advent of the automobile when the horse and buggy were still in style. Then Columbus led the country in buggy manufacture, but today the last vestige of such industries is gone, except as a few small producers of harness and allied accessories point to the fact that horses are still used only occasionally. In place of this former thriving industry there are assembly plants for automobiles, and establishments of manufacturers of accessories, among them auto-heaters. Recently, following upon the establishment of one of the country's best airports, aeronautical production has been added to the list of local manufacturers. Such are the transformations in a city's industries to which the people must always be alert if they wish to maintain themselves upon the highways of progress.

In the ceramic industry, included under Group 7, Columbus holds a unique position. Located in close proximity to high quality clays, cheap coal and abundant natural gas, the manufacture of clay products secured an early start in the state although the scale of production was small. It seemed to the authorities at Ohio State University that a ceramics department should be included among its various activities as a part of its function to aid in the economic development of the state. This department, headed by Gen. Edward Orton, was the first of its kind in the country and since its inception in 1894 it has maintained pre-eminence in ceramic research and the training of ceramic engineers. Columbus is the headquarters for the American Ceramics Society, and 17 local factories enjoy the privileges of membership.

The industrial potentialities of the city are large. Cheap fuel is at the city's back door in the hills of southeastern Ohio and in West Virginia. Coal and natural gas as well as minor deposits of petroleum meet the requirements of most industries that use them. Iron ore may be brought economically from lake ports. Limestone is abundant and in variety. Clays, glass, sand, gravel and shale, may be converted into many useful products. Transportation facilities both for bringing raw materials from a distance and for distributing the finished products are of a very high order.

For the realization of the ultimate industrial possibilities, all that is needed is the co-ordination of the business interests in a scientific study of the situation and scientific application of the findings. This mode of approach is now under way, the Industrial Bureau of Columbus, the Bureau of Business Research, Ohio State University, Orton Memorial Laboratory and Battelle Memorial Institute being engaged in studies of this nature.

CHAPTER IX

THE TRANSPORTATION SYSTEM OF COLUMBUS

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THE saying that one is no stronger than one's arteries applies to cities as well as to men. The modern city is far from being economically self-sufficient, and whether its trade with others is physically easy or difficult is an extremely important economic matter.

The unusually complete transportation system enjoyed by Columbus today dates back to the picturesque settlement of the Northwest Territory. We are told that during most of the first quarter of the nineteenth century, east and west traffic of importance passed through Chillicothe by Zane's Trace and that early Columbus settlers employed individuals to carry the meager outgoing mail to the more southern village, from where it was distributed to other centers. With the extension of the National Road from Zanesville west to Columbus in 1833, the rapid development of the latter city bgan. The opening of the road was hailed by the settlers of that time as of immense economic importance. It was the beginning of the development of a vast trade track now stretching from the Atlantic seaboard to Pittsburgh, Columbus, Indianapolis and St. Louis, to extend from there into the great stretches of the west and southwest.

How difficult it is to forecast correctly the future of transportation development is illustrated by the enthusiasm the nation had for canals during the first half of the past century! Few transportation ventures started with higher hopes than did the Ohio Canal connecting Cleveland with Cincinnati, and including a feeder line into Columbus. We are told that the first boat arrived in Columbus from Cincinnati late in September, 1831. A great celebration was staged in Columbus. Amid the festivities, attended by great and small, many toasts were drunk, one of the most interesting being the following: "The Ohio Canal, the great artery which will carry vitality into the extremity of the Union." Another to the citizens of Columbus was: "Behold how good and how pleasant it is for brethren to dwell together in unity. Who envies, this day, let him slink back to his cavern and growl."

Passengers and freight were transferred to canal boats at the Ridgeway warehouse on the Scioto. Governor Clinton of New York, speaking in Columbus at the celebration of the commencement of the Canal, said, "In five years it may, and probably will be completed, and I am greatly of the opinion that in ten years after the consummation of this work, it will produce an annual revenue of at least one million dollars." Many of these canals did serve useful purposes at the time, but for the most part they were superceded by railroads during the middle of the last century.

The first railroad train into Columbus arrived from Cincinnati in 1850, running over the Columbus and Xenia line, constructed in 1848-49. Cincinnati, Columbus and Cleveland were first connected by rail in 1851 when the Cleveland, Cincinnati, and Columbus Road was inaugurated. This line is now the Akron Division of the Pennsylvania Railroad. The Central Ohio Railroad, projected from Columbus to Zanesville and on to the Ohio river, was commenced in 1850 and two years later was finished as far as Zanesville. In 1859 it went into the hands of a receiver and remained there until it became part of the Baltimore & Ohio System in 1866. By 1853 the Columbus, Piqua and Indiana Railroad was in operation. Quite a network of railroads overspread Ohio by 1860, connecting all the more important centers.

With the exception of the canal, all the old transportation lines of the middle of the century remain today, expanded and improved to suit modern needs. Columbus is now served by seven important railroads: The Pennsylvania Railroad, The Chesapeake & Ohio, The Big Four, The New York Central (Toledo & Ohio Central), The Baltimore & Ohio, The Norfolk & Western, and The Hocking Valley, with fifteen divisions of these roads centered in the city. These railroads are controlled by systems operating approximately forty-five thousand miles of railroad, or almost one-fifth the total railroad mileage of the country. The adequate transportation facilities of Columbus were cited by army headquarters in a report on the establishment of a General Reserve Depot. This report said in part, "Columbus was selected for this Depot because of its splendid single and double track railways and terminal facilities and trunk line service to any part of the United States." While to the easterner, Columbus may be considered a part of the far west, its actual proximity to the Atlantic seaboard cities is seen in the fact that mail posted in Columbus at the close of a business day is delivered in New York offices early the following morning.

The plain in which Columbus lies affords easy upkeep for railroads. Consequently operation costs are low and rates assessed in this territory are correspondingly favorable. In the territory which includes Columbus, railroad rates are quite generally established on a mileage basis. This method is comparatively beneficial to the city and to surrounding territory. From Columbus to points in other classification territories, rates based on mileage are gradually replacing the old combinations of local rates, bringing distant cities closer in transportation costs.

Four of the railroads which serve Columbus are important coal hauling lines. The Hocking Valley Railroad, with operating headquarters here serves the Hocking Valley of Ohio and extends thru Columbus as far north as Toledo. The Norfolk & Western Railroad extends from Norfolk to its northern terminus at Columbus. The Toledo & Ohio Central Railroad, now part of the New York Central System, serves territory from Charleston, West Virginia, thru Athens, Ohio, to Columbus and north to Toledo. The General Manager of this road has headquarters here. The other coal road, the Chesapeake & Ohio, carries only freight on its lines into Columbus and connects here with the Hocking Valley. The other roads have a more varied traffic.

The Pennsylvania, New York Central System, Baltimore & Ohio, Norfolk & Western and Chesapeake & Ohio give Columbus direct access to all important Atlantic seaboard ports from Boston to Norfolk. This service encourages the development of foreign export shipments within Central Ohio.

The main New York-St. Louis line of the Pennsylvania Railroad, following closely the important trails of the pioneers, makes Columbus a major traffic point. Freight from the east and west is transferred in all directions here, giving Columbus far more merchandise cars in and out of the city daily than such a city alone could utilize. Not only in number of trains, but in speed and completeness of service, Columbus traffic is benefitted. This railroad maintains important shops for both light and heavy running repairs and employs more than five thousand men in all its Columbus departments.

Transportation facilities in Columbus are exceptionally good. Four hundred miles of railroad tracks are maintained within the city, a number of large classification yards are available for expediting freight traffic, and adequate freight house facilities are provided, conveniently located for the prompt handling of less than carload traffic. About 160 passenger trains, 148 of which carry mail, pass in and out of Columbus daily. Sixty million tons of thru freight are routed by way of the city each year, and another ten million tons are brought in and sent out of the city annually as part of Columbus trade and industry. In 1928 several of the railroads launched in Columbus a grade crossing elimination—yard extension program involving the expenditure of about nine million dollars. The 1929 railroad payroll in Columbus will exceed $23,000,000.

A network of interurban, motor bus and motor truck lines supplement the steam railroads. A glance at a transportation map of Ohio shows Columbus as one of the six local points for highway and interurban traffic. Eleven important highways run through Ohio's capital, carrying, according to a 1927 State survey of transportation, a daily traffic of 19,332 passenger cars and trucks, with 44,860 on a maximum traffic day.

The completeness of transportation facilities has made of Columbus an important distributing center, with a radial trade territory of about seventy miles economically served from this center. With the advent of trucking service to smaller consuming centers, the excellent roads which have been built in the jobbing territory have permitted a continuation of close business relations developed in early times between cities and towns of Central Ohio. Transportation has probably been the outstanding factor in the balancing of Columbus' economic activities between trade and manufacture.

CHAPTER X.

BUSINESS CONTACTS ABROAD

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FORTY-EIGHT countries receive annually Columbus-manufactured highly-specialized industrial machinery which embraces lines of concrete mixers, hoists and derricks, conveyors and coal-cutting machinery. These exports totalled for the period from 1922 to 1927 more than three-fourths millions of dollars. Ordinarily about thirty per cent of such originate in Columbus, while in 1923 forty-six percent of the exports originated here. The following table shows the outstanding countries to which these lines of industrial machinery are sent. Forty other countries each receive less than $75,000 annually and are omitted from the list.

Table 1

Export of industrial machinery from Columbus, Ohio, 1922-26.

Great Britain	$1,330,000
Australia	360,000
France	240,000
Cuba	235,000
Japan	210,000
Mexico	210,000
Russia	170,000
Chile	150,000

These manufactures for the most part have high values per unit of weight and being non-perishable lend themselves to profitable carriage to all parts of the world under almost all conditions of climate and handling. With the continued mechanization of industry in various parts of the world, Columbus exporters of industrial machinery confidently expect a prosperous future.

Among the specialties exported from Columbus, porcelain teeth, aluminum typeletters, library paste, and enameled sanitary ware rank high. The countries to which they are shipped in the order of relative importance are England, Canada, Cuba, Mexico, and Australia. As in the case of machinery they are patented and to some degree are exclusive goods.

A recent survey made by the writer revealed that many Columbus goods sold primarily in the United States have also a good market abroad. Materials used in the field including water pumps, valve grinders, seat and tire covers are sold regularly in Australia, Argentina, South Africa, British India, Canada, and the countries of northwestern Europe in annual amounts exceeding $20,000.

Gas ranges and steel cabinets amounting to over $10,000 each year are sent to Cuba.

Patented medicines, pharmaceuticals, soaps, and perfumes are sent by mail to Cuba, Porto Rico, Nicaragua, Mexico and Columbia.

Leaf lard rendered in Columbus is increasing in favor in England and Italy.

Weighing scales of delicate adjustments manufactured locally are used by hatmakers in Paris and flour millers in Buenos Aires. Operating tables and hospital cots made in Columbus are in service in hospitals in Tokio. Plows made locally are turning fertile furrows in the fields of Manchuria near Harbin. The dumb waiter lifts of a new apartment building in Edmonton originated in Columbus. A manufacturer of fire engines has recently furnished equipment for Winnipeg and Yokohama.

In most instances Columbus exporting firms sell thru brokers with offices in a port city. However a few firms maintain their own staff of salesmen who call regularly upon customers in Europe, South America and the Carribbean region.

The successful experience of these manufacturers in selling abroad is attracting the attention of others to the possibilities of foreign markets. Virtually all local manufacturers have potential markets in foreign markets which merely await the invitation to buy.

Most of the importing is done by department stores and specialty shops. Many local shops feature their imported goods and mark them conspicuously for their clientele.

A cursory examination of imported goods offered for sale in local stores indicated a wide range of commodities. From Belgium is found porcelain, linens and voiles; from Czechoslovakia, jewelry and crystals; from China, embroidery and cloissonne; and from England, clothing, woolen hose, woolens and worsteds for manufacture. France sent perfumes from Grasse, dresses, shoes and gloves from Paris, and china from Limoges. Germany ships shoes, "sueded" gloves and toys; Holland supplies tulip and other bulbs, and woolen shawls.

Numdah (goat hair) rugs come from India; earthen statuary, leather novelties and straw baskets arrive from Italy. Scotland sends woolen steamer rugs, while "Porto Rican" gowns, silk and cotton underwear are shipped from the Philippine Islands.

One Columbus firm is a large direct importer of raw Brazil coffee amounting annually to over $100,000. Peanuts from China shipped to this firm exceed in value $15,000. Most of these products are consumed in Central Ohio.

Columbus is well situated for direct importing. A custom office for clearance of goods and excellent railroad services offering cooperation to local buyers at ports of arrival whereby goods consigned to Columbus firms may be sent direct to the port without any appreciable delay, facilitate the movement of imports.

The backbone of Columbus export trade lies in the sale of industrial machinery and specialty goods largely to countries in Europe and Latin America, and to Canada. The bulk of the imports consists of manufactured goods ready for sale and a few crude foodstuffs needing some preparation. Those who have engaged in either importing or exporting are very enthusiastic. Importers are enthusiastic because imported goods add a nice variety to their merchandise offerings. The exporters find foreign trade worth time and energy because it furnishes an outlet for an increase in production and thereby gives stability and profits.

CHAPTER XI

WHAT COLUMBUS OFFERS AIR COMMERCE

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ANY discussion of Columbus' facilities for air commerce should, at the outset, direct attention to its geographical position, for it is this that augurs most for the ultimate development of Columbus aeronautically. In the foregoing chapters attention has been paid to the resources of the Columbus region; the one inexhaustible resource which gives stability and permanence to Columbus is that of geographical position.

Ohio, located as it is between the Great Lakes and the Ohio River, is in such a strategic position that all of the east and west railroads between the surplus-producing interior of the United States and the Atlantic coast pass through this state. Columbus, located very near the geographical center of Ohio and directly in the path of the two principal trans-Appalachian routes, is served by seven great railroad systems comprising fifteen divisions operating out of the city. There is no more important trade route between Lake Erie and the Ohio River than that through Columbus to Cincinnati and Cleveland. Columbus is therefore situated at the principal cross-roads of north-south and east-west traffic.

It was not by accident that the nation's center of population and of manufactures (based on wage earners) passed westward through Central Ohio; today the former is some two hundred miles due west of Columbus, and the latter almost within the city limits. Its position on the dividing line between the agricultural west and the manufacturing east, between the iron ore of the Upper Lakes and the coal of the Appalachian Plateau, between the poorer soil of the unglaciated southeastern Ohio counties and the fertile soil of the rest of the state, and between the oil and gas of the northwestern counties and the clay and coal of the southeast, places Columbus in the midst of the stream of commodities moving between these great regions. Rather than the monopoly of an exhaustible natural resource, it is the relation of Ohio and of Columbus to the great producing and consuming centers that accounts for the fact that Ohio was the first and only state to have two million population within one generation, and Columbus grew to more than three hundred thousand within a century of its founding.

Air commerce capitalizes this significant position. Between the Great Lakes and the tremendous bulk of the Appalachian system is forced the bulk of the east-west transportation of all kinds, rail, highway and air. An inspection of the trans-montane routes reveals an increasingly difficult crossing as the routes are projected south of the Mohawk Valley in New York. On all routes south of that one, until a point is reached as far south as Atlanta, the mountains are higher, the terrain more rugged, there is less habitable country, and fewer roads and railroads. Flyers are unanimous in their preference for regular flights over habitable country where roads and railroads are well developed, and where the terrain permits a "ship" to be set

down almost anywhere without undue hazard. Experience with existing airways dictates consideration of flying conditions, despite the improvement of equipment and personnel.

All along the Ohio River and the entire southeastern third of Ohio, the terrain is so rugged that its presents a sharp contrast with the flat lands extending through the central part of Ohio, Indiana, and Illinois. All south

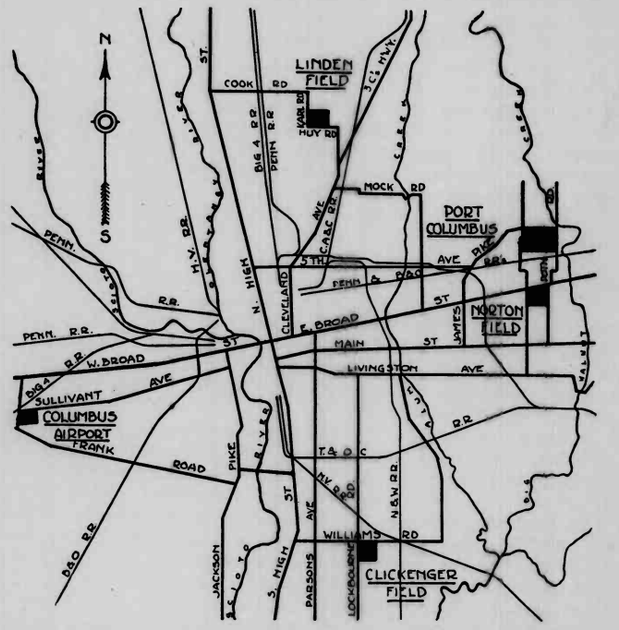

FIG. 20. Airports of Columbus. Port Columbus is the huge municipal field. Norton Field is for military purposes. The Columbus Airport is used by the mail planes. Clickenger and Linden fields are commercial fields.

of the Ohio River is likewise fairly rugged country which merges with the Appalachian plateau on the east. That topography has been potent in determining the concentration of people and transportation routes is quite obvious.

Rugged topography presents not only the difficulty of making emergency landings, but there is also a direct relation between the earth's surface and the atmospheric conditions obtaining over it. The principal hazard of the Appalachians is not the broken country as such, but the disturbed atmospheric conditions found over the whole Appalachian system. Large bodies of water also influence greatly the movement of air and the rainfall.

The route for all airways from the interior lowlands to the Atlantic seaboard is through Ohio. The northern routes are flown by way of Cleveland; all others are routed through Columbus. The model airway flown by the United States Army Air Service, the oldest organized airway in the country, was flown from the interior through Columbus to the Atlantic coast. This experimental service was discontinued as soon as commercial lines began operations over various sections of the airway. A survey of flights made from Washington, D.C., from Norfolk, Va., from Philadelphia, and from New York westward to interior cities not on the Lakes, reveals that a vast majority fly first to Columbus and then over the plains westward.

No airport is going to be selected as the last stop going east or the first going west if that port is so situated with respect to land forms that regular flying cannot be uninterruptedly carried on throughout the year. Even from Cleveland, Cincinnati or Chicago to New York there are many days during the year when it is desirable to fly east by way of Columbus, from any of these cities. Nature has given Columbus a very significant position with respect to the principal hazards of flying. From the flyer's point of view, this route would be as nearly perfect as any in the United States.

Ohio Valley cities are served by an air-mail line passing through Columbus and northward to Cleveland. The first coast to coast air-rail line, the Transcontinental Air Transport, Inc., has its eastern air terminal at Columbus. Here the first air-rail passenger station in America receives passengers from trains of three railroads and transfers them directly to planes waiting a few steps away.

Many local flying schools and large national flying organizations make Columbus their headquarters. A division inspector of aircraft, with territory covering two states, is permanently assigned to Columbus by the United States Department of Commerce. Ohio was a pioneer in the creation of a State Director of Aeronautics.

Of the several new air mail lines projected by various sections of the United States, chief among them is a high speed line from the far Southwest through St. Louis, Columbus, and Pittsburgh to New York. Concerning air mail in general and this line in particular, the Postmaster General, Walter F. Brown, has expressed himself as follows:

> **"My own judgment is that the Federal Government should concentrate its exceptional aid on a few natural transportation routes. That is to say, routes which have been traveled by ox team, pony express, railroad, automobile and airplane, because people and commodities have traveled over such routes since white men came to North America. The Government's encouragement to the public to fly over these routes should be as complete and convincing as possible."**

The sketch of the city's landing fields with port accommodations bespeak the adequacy of air port facilities here. With an A-1-A rating by the Department of Commerce, Port Columbus is the equal of the world's greatest airports.

The Port comprises two units, the transport field and the school field of 400 and 250 acres, respectively. They have been fully subsoil drained and graded.

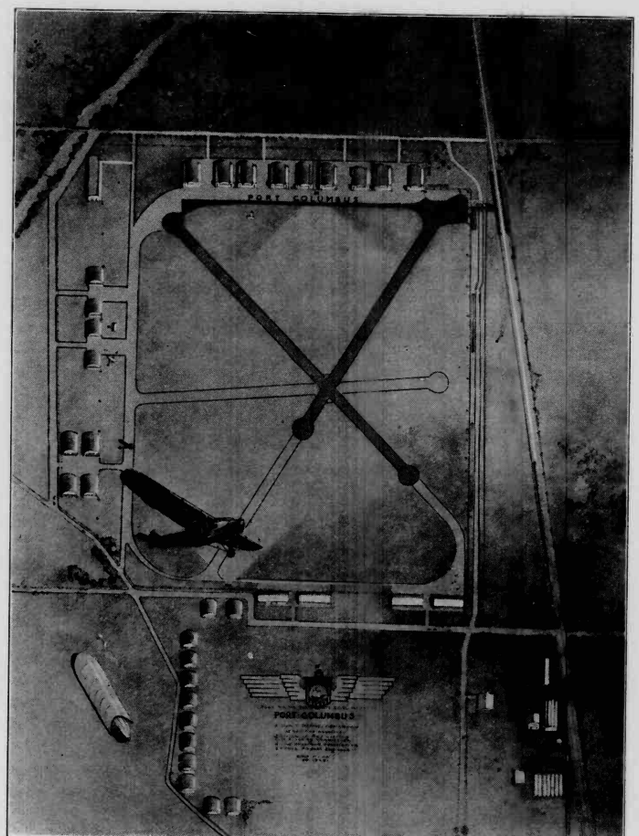

FIG. 21. Port Columbus, the Municipal Airport.

Two asphaltic-concrete surfaced runways, 2500 and 3500 feet in length and 100 feet wide, with a 30 foot connecting taxi strip 2500 feet long, have been laid down. The Administration Building houses the passenger station, rest rooms, ticket offices, accommodations for transient men and women pilots, superintendent's office, restaurant and dining room, rental offices and lighting control tower. The Port is fully equipped with floor, beacon, course, boundary, obstruction, ceiling and building flood lights.

FACTS ABOUT COLUMBUS

Columbus is the first large city west of the Appalachian plateau.

Columbus is 680.347 (city datum) feet above sea level.

Columbus is almost the exact geographical center of Ohio.

Columbus is two hundred miles east of national center of population.

Two-thirds of the population of the United States is within a radius of 500 miles of Columbus.

Columbus is within eight miles of nation's center of manufacturing, as determined by number of wage-earners, U. S. Census of Manufactures.

Columbus had a $138,470,509 payroll in 1928.

Adjusted tax rate (actual value) for 1929 was $17.44 per $1000 of valuation; this was next to lowest of six largest Ohio cities.

The famed National Road and thirty-nine other highways pass through Columbus.

Fifteen divisions of seven trunk line railroads operate out of Columbus.

Columbus is the eastern air terminal of the Transcontinental Air Transport, Inc.

Columbus is a great meeting place. In 1928 there were 311 national, region, and state conventions bringing nearly 200,000 guests into the city.

The Ohio State Fair attracts 400,000 visitors annually.

Columbus is the home of Ohio State University. Just within the city's gates is Capital University.

The Battelle Memorial Institute, a laboratory memorial to local pioneers in the steel industry, is a center for scientific and industrial research in metallurgy and fuel.

The Orton Memorial Laboratory is dedicated to ceramic research.

The Bureau of Business Research, Ohio State University, and the Industrial Bureau of Columbus are fact-finding organizations which interpret industrial conditions and trends, for the benefit of Columbus and Ohio.

Forty-one federal departments and bureaus are represented in Columbus.

Five libraries house 740,000 volumes.

Five senior high schools, twelve junior high schools, fifty-two public schools and twenty parochial schools are caring for the education of 50,000 Columbus children. Four colleges and seminaries enroll 800, while 13,000 attend the Ohio State University annually.

There are 1177 acres of parks and play grounds.

A Gallery of Fine Arts and art school are being rebuilt.

The city has the largest Woman's Music Club in the United States.

Columbus is the largest city in the world named after the discoverer of America.

Columbus Ohio

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